Event Processing:
Insight into Your CICS Systems and Business

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Agenda

- Context/Setting the Scene

- Event Processing in CICS TS V4.1

- Event Processing in CICS TS V4.1 Demo

- Event Processing in CICS TS V4.2

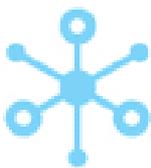- Event Processing in CICS TS V4.2 Demo

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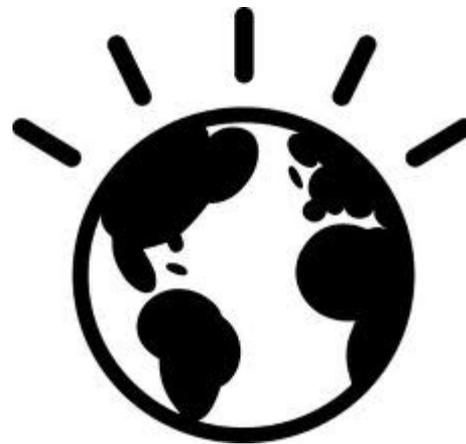- Event Processing in CICS TS V4.2 Demo

We are living in a new landscape…

Instrumented.
Interconnected.
Intelligent.
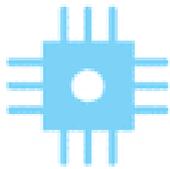
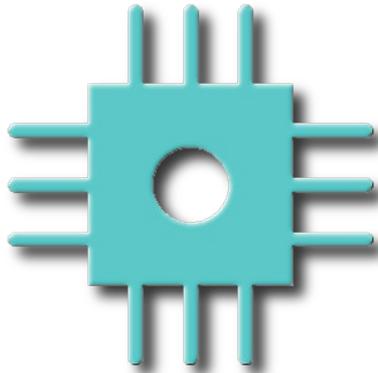**People**

Companies

Institutions

Industries

Man-made systems

Nature's systems

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Instrumented

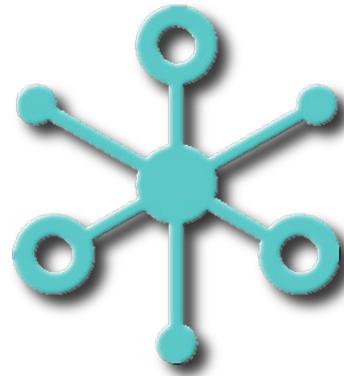"Today, there are **1 billion** transistors for each person on the planet"[1]

"There are **33 billion** RFID tags embedded into our world and across entire ecosystems"[1]

[1] Sam Palmisano speech, November 12, 2008

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Interconnected

"The internet of people is nearly **2 billion** strong. Almost one third of the world's population"[1]

"Over **4 billion** mobile phone subscribers worldwide"[2]

[1] World Internet Users and Population Stats
[2] World Bank, World Development Indicators

Intelligent

"Every day, **15 petabytes** of new information are being generated. This is 8x more than the information in all U.S. Libraries"[1]

"An average company with 1,000 employees spends **$5.3 million** a year to find information stored on its servers"[1]

[1] New Intelligence White Paper from ThinkForward website

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Information is Everywhere and Consumable

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What does this mean for businesses?

- If a business can become **instrumented** and **interconnected** then end to end process visibility can be achieved.

- This visibility allows **intelligent** decisions to be made which enables the business to…

Mitigate Risk and Identify Opportunities

React with Greater Agility

Deliver Faster Time to Value

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What's the problem?

- Clearly businesses need to keep up with the changing landscape of technologies…

- …but struggle to do so because they can't update the old applications that underpin their processes.

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The Solution?

CICS TS

"**The** computing environments **on which business applications run must provide capabilities to non-invasively instrument them to take advantage of these technologies" [1]**

Event Processing

[1] Paraphrased from: Smarter Banking with CICS Transaction Server Redbook

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What are Business Events?

*"As the pace of interactions increases, untapped potential exists in the **business events** flowing throughout our enterprises"*

Large companies can experience up to **800 Billion** business events daily

Nearly **4 Trillion** RFID events are emitted each day

Over **30 Billion** CICS transactions per day

*"A **business event** is an action that has happened, or the absence of it happening, which has relevance to the business"*

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What is Business Event Processing?

"Turn insight into action"

Event

Pos Purchase

Business Context

2nd purchase in a week and total purchases this year > $1000

Action: Offer loyalty program membership before customer leaves the store

Event

No meter signal

Business Context

Third consecutive period without signal

Action: Trigger automated troubleshooting process
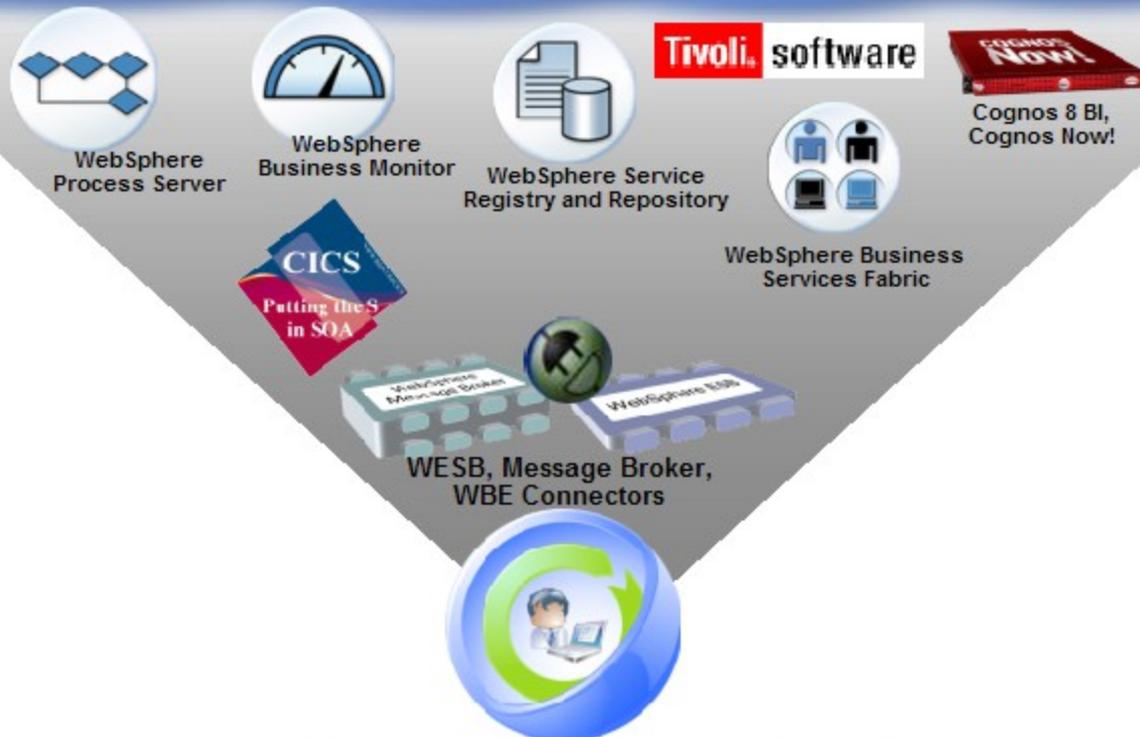
Event

GPS Signal

Business Context

Calculated arrival > 30 min over SLA

Action: Phone customer to re-arrange delivery
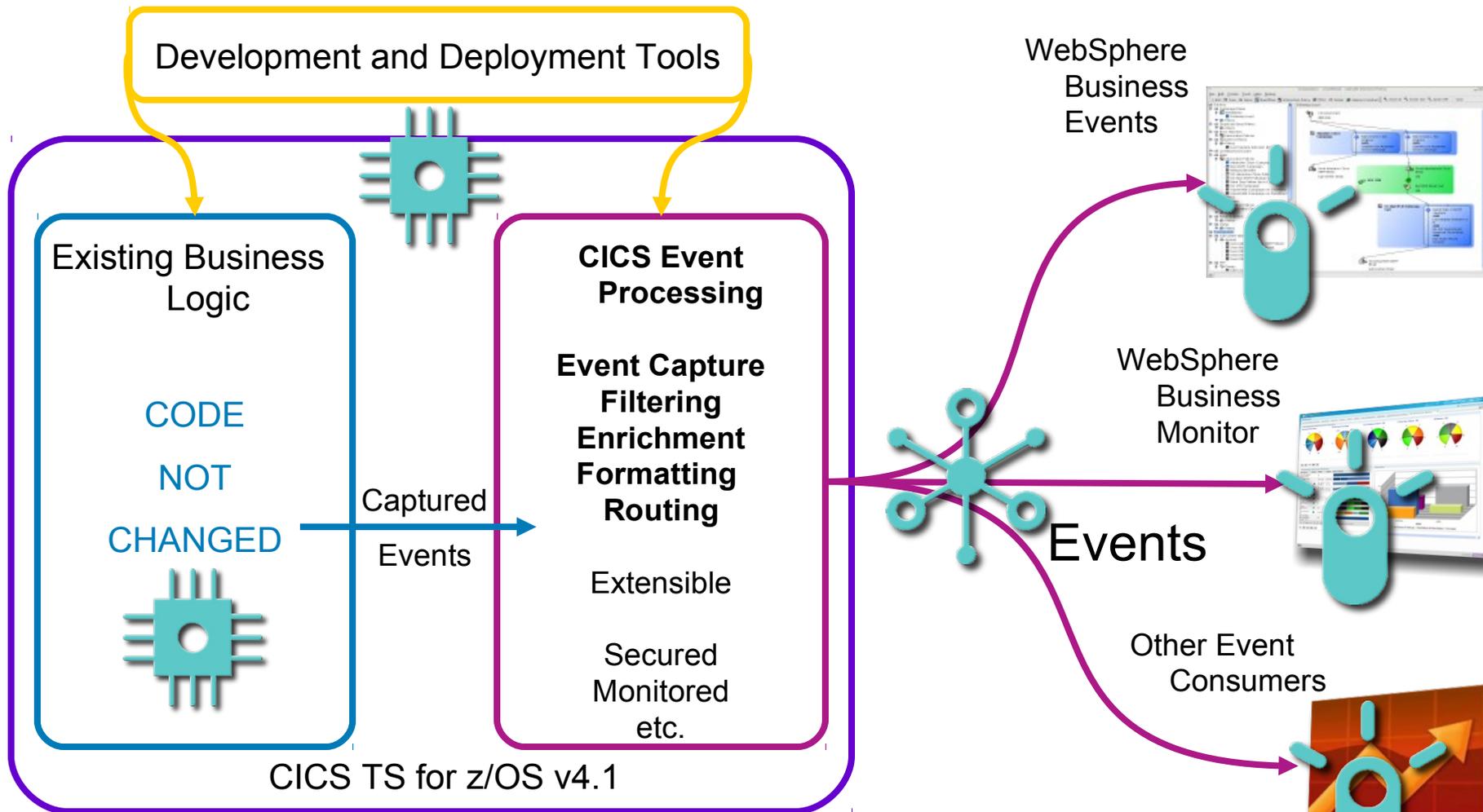
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IBM Delivers Business Event Processing

CICS plays a key part

"CICS runs Core Business Logic"

"CICS is where business events happen"

"CICS must provide the ability to capture and emit events in a non invasive fashion"

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CICS TS V4.1 Event Processing Support Overview

Development and Deployment Tools

WebSphere Business Events

Existing Business Logic

CODE

NOT

CHANGED

Captured Events

CICS Event Processing

Event Capture Filtering Enrichment Formatting Routing

Extensible

Secured Monitored etc.

WebSphere Business Monitor

Events

Other Event Consumers

CICS TS for z/OS v4.1

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Where can events be captured?

- In CICS V4.1 events can be captured at…

- **…any event enabled API call**
  - Non invasive

- **…program initialisation**
  - Non invasive

- **…an explicit EXEC CICS SIGNAL EVENT call**
  - Small program change required

Capture Point
Select an Application or System capture point.

Application Capture Point

CONVERSE
DELETE FILE
DELETEQ TD
DELETEQ TS
INVOKE SERVICE
LINK PROGRAM
PROGRAM INITIATION
PUT CONTAINER
READ
READNEXT

○ Before ● After

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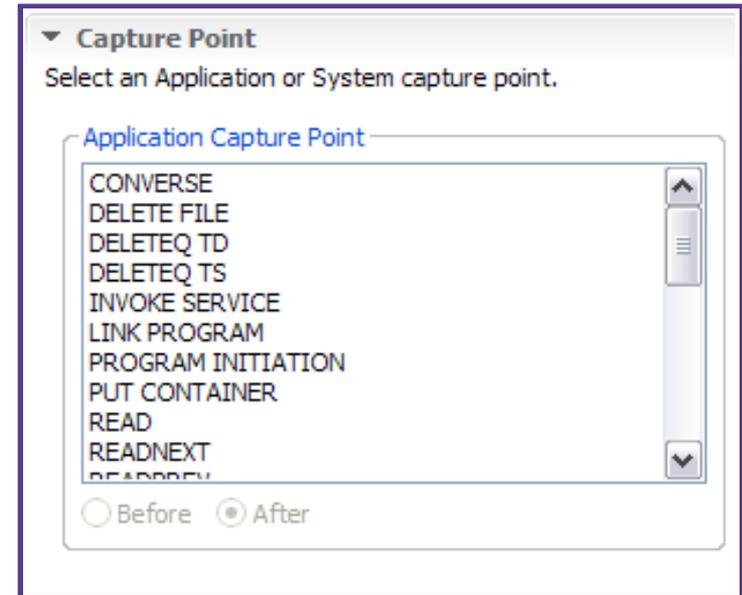
Filters

- There are 3 types of filter that can be used to determine that an event has happened at a particular capture point:

  - **Context filters**

  - **Command option filters**

  - **Data filters**

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Context Filters

- Allow you to identify events based on context, for example:

  - **Current Transaction**

  - **Current Program**

  - **Current User ID**

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Command Option Filters

- Allow you to identify events based on attribute values in the API command of the capture point, for example:

  - **File name on a WRITE FILE command**

  - **Channel name on LINK PROGRAM**

▼ Application Command Options
Define predicates for command options. Predicates marked with * should be specified to maintain CICS performance.

Name	Operator	Value
FILE*	Equals	FACCOUNT

Data Filters

- Allow you to identify events based on data values in the application, for example:

  - **Integer at offset 25 in the FROM field on a WRITE FILE command is greater than 500**
  - **Data in a certain container in the current channel**

Source	Container	Offset	Length	Operator	Value	
FROM		25	4	Greater Than	500	

Application Data
Define predicates for application data. Import a language structure and pick an item to specify the data format.

Add...
Edit...
Remove...
Move Up
Move Down

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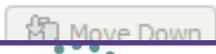
Capture Data

- Once an event point is identified, data can be captured from the application to populate the event

The Performance Question…

EP On/Off	Capture Point in Spec	Primary Predicate Match	Other Predicate Match	Capture Process	Cost
OFF					negligible
ON	NO				negligible
ON	YES	NO			0.18 microsecs
ON	YES	YES			0.225 microsecs
ON	YES	YES	NO		+0.01 microsecs per predicate
ON	YES	YES	YES	YES	+11 microsecs

The Performance Question…

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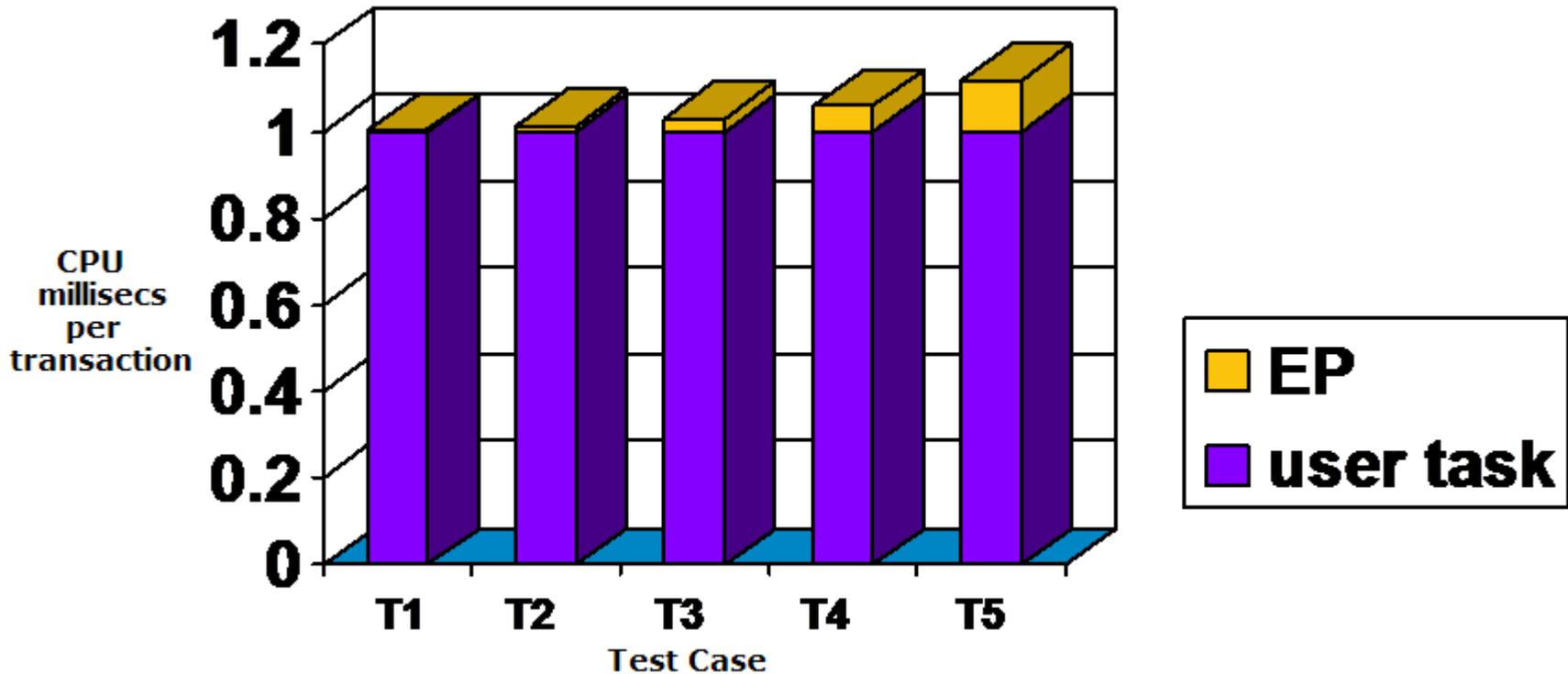
Event Emission

- Once and event is captured it is queued for emission via an Event Processing Adapter

  - EP Adapters format and emit events from CICS using a range of transports:

    - WebSphere Message Queue

    - Transaction Start

    - TS Queue

    - Custom

"But I don't have MQ.
How do I emit my events from CICS?"

Solution: A new HTTP EP adapter.

- Once and event is captured it is queued for emission via an Event Processing Adapter

  - EP Adapters format and emit events from CICS using a range of transports:

    - WMQ

    - **HTTP - APAR PK94205** http://www-01.ibm.com/support/docview.wss?uid=swg1PK94205

    - Transaction Start

    - TS Queue

    - Custom

▼ Adapter
Choose the adapter to emit events produced by this binding.

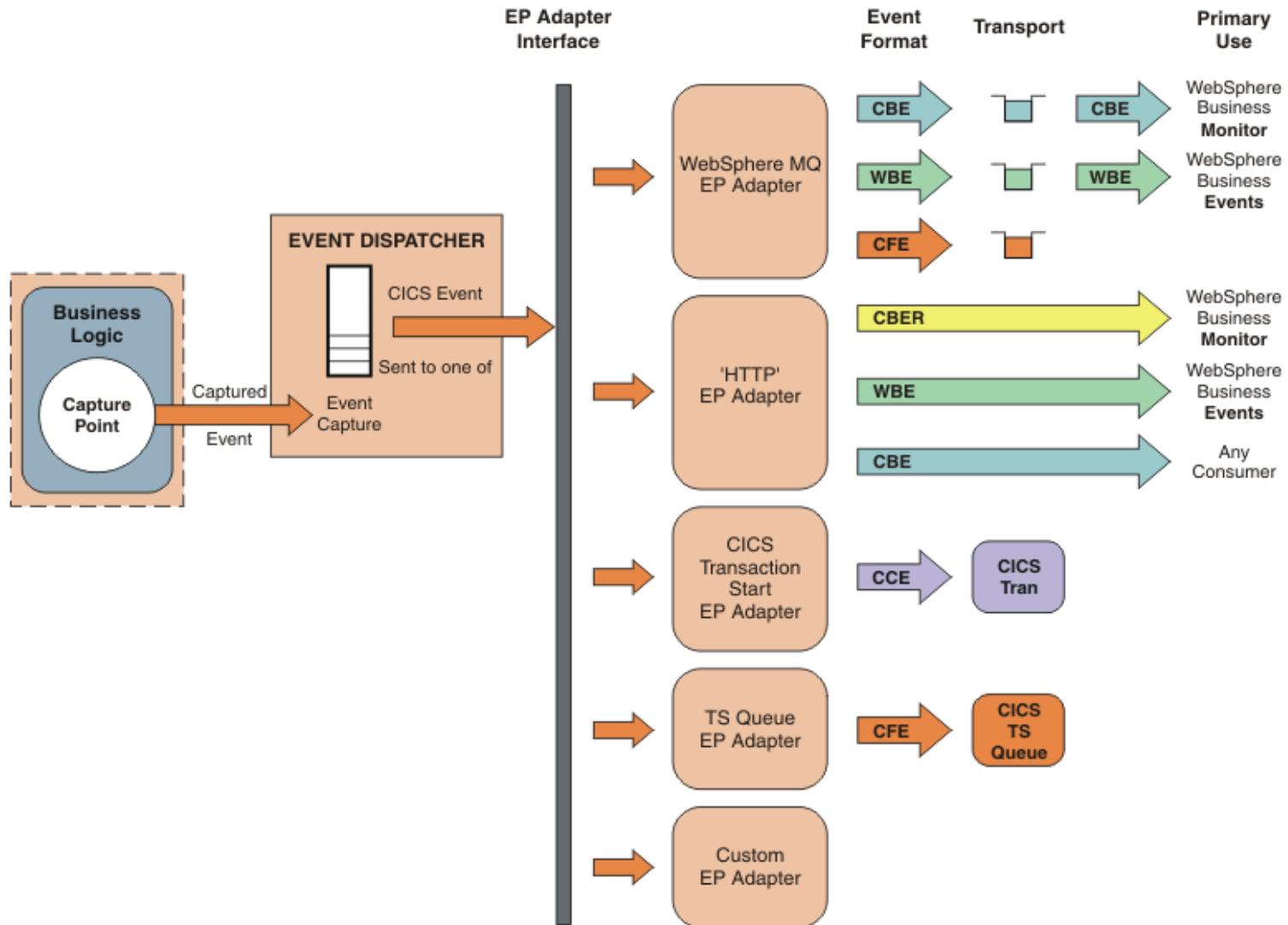|	
Adapter	HTTP
	Emits events to an HTTP server using HTTP POST in XML format for consumption by products such as WebSphere Business Events and WebSphere Business M
Urimap	EPDEMO
Data Format	Common Base Event REST (XML)

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Event Emission

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EP Adapters Advanced Options

- Dispatcher Priority – Normal or High

- Transaction ID – Run the EP adapter with a specific Transaction ID

- User ID – Run the EP adapter with a specific User ID

- Events are Transactional
    - When set, causes CICS to wait for sync point completion before either emitting or discarding event (depending on sync point outcome)
    - *Note:* Transactional events are not emitted until the UOW reaches sync point – for some transactions, this could mean the events are not very close to real-time

▼ Advanced Options
These optional dispatcher settings are for advanced users.

Dispatch Priority	Normal
Transaction ID	
User ID	☐ Use Context User Id
Events are Transactional ☐	

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Event Bindings

- Tells CICS how to indentify, capture, format and emit events

- Created using the CICS Explorer Event Binding Editor

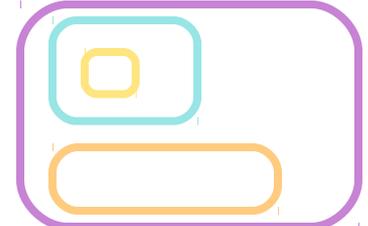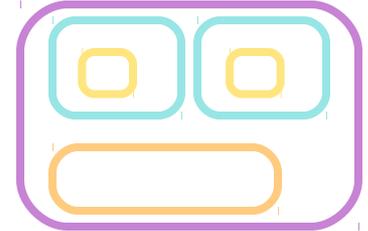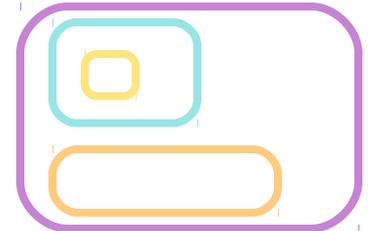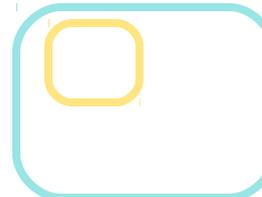- Installed via a Bundle and managed like any other CICS resource

Event Bindings

Bundle

Event Binding

Business Event Specification

Capture Specification

EP Adapter Configuration
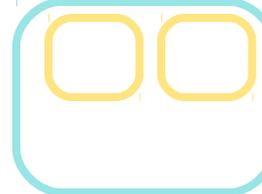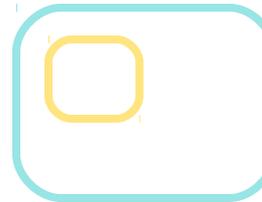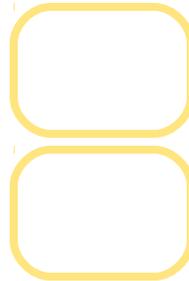
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- Event Processing in CICS TS V4.1 Demo

- **Event Processing in CICS TS V4.2**

- Event Processing in CICS TS V4.2 Demo

Event Processing in V4.x

- Event Processing in CICS TS V4.1 is a good foundation.

- Event Processing in CICS TS V4.2 builds on that foundation to enhance both capability and usability.

- Event Processing in CICS TS V4.2 aims to address customer questions arising from interest in the V4.1 capability.

Event Processing in V4.2 basic improvements

- More data types supported for filter and capture:
  - Sign leading/trailing Zoned Decimal
  - Hexadecimal floating point
  - Binary floating point
  - Decimal floating point (requires optional hardware facility)
  - Null terminated character
  - Null terminated hex

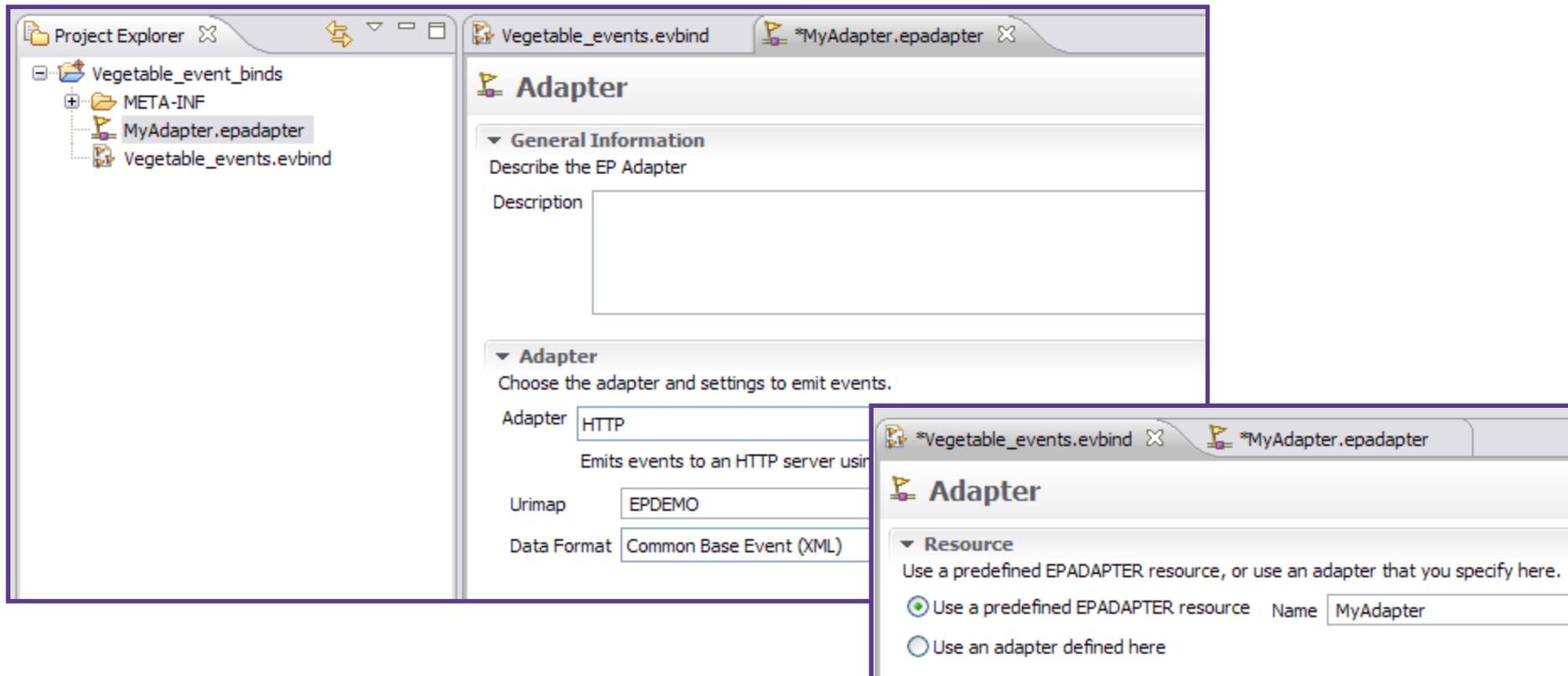- HTTP EP adapter performance improvements if using a URIMAP with SOCKETCLOSE set.

Customer Question

"We've started using events and we have many event bindings. All of our events are emitted using identical EP adapter specifications. What happens if need to change the EP adapter specification? We worry that it would be a lot of work to change it due the number of event bindings we have."

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Solution: Separate EP adapters

- In CICS TS V4.2 EP adapter specifications can be defined and managed separately to Event Bindings.

- Event Bindings can reference these EP adapters by name.

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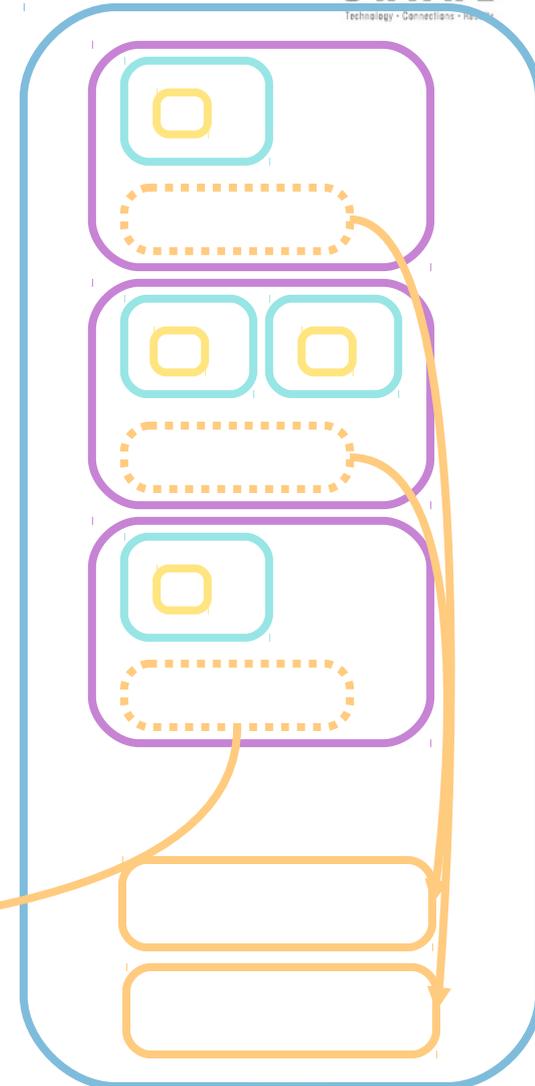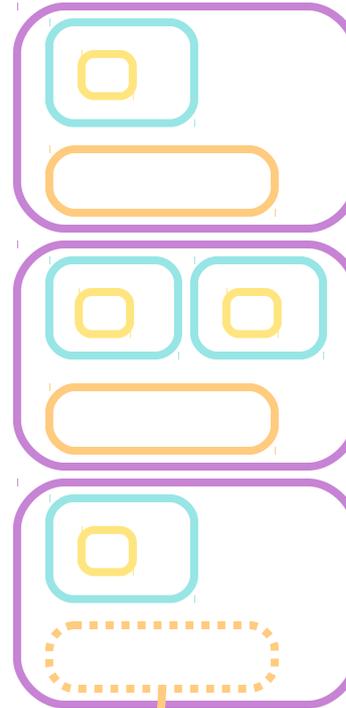# EP adapters in bundles

Bundle

Event Binding

Business Event Specification

Capture Specification

EP Adapter Reference

Separate EP Adapter Specification
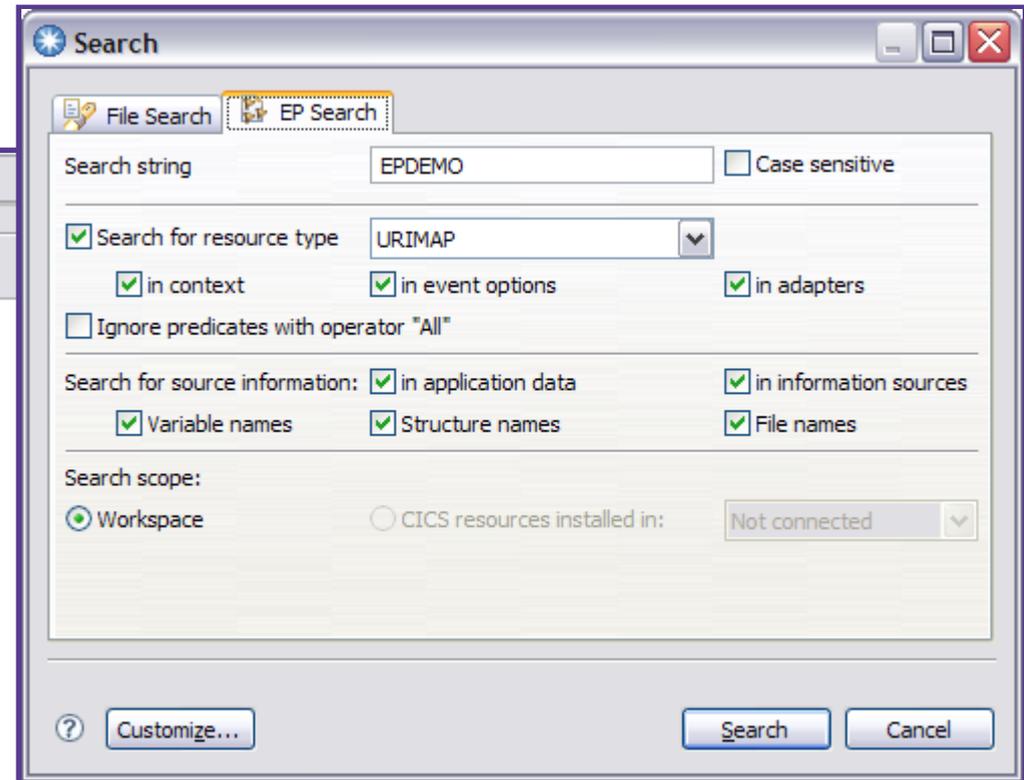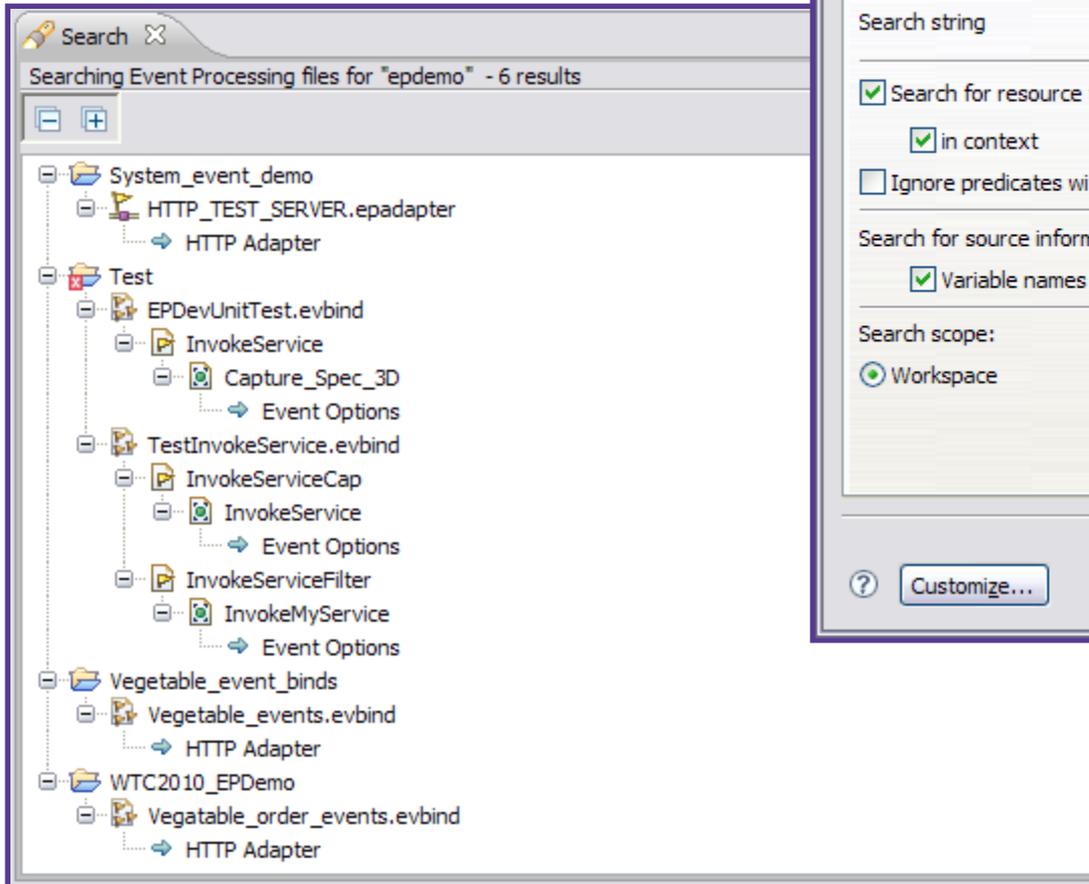
"We emit events from a number of our applications. If we ever needed to make a change to any of those applications how would we know which event capture specifications could be affected and may need updating?"

Solution: EP Search

- Available in the CICS Explorer

- Enter the name of the thing you have changed and EP search will tell you which event bindings may be affected.

- 'Things' include:
    - CICS resource names
    - Language Structure names
    - Language Structure field names

- Searches event bindings in the CICS Explorer workspace and those installed in CICS regions that Explorer is connected to.

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EP Search Interface

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"I can see how events can be used for non critical functions like monitoring and analytics, but how can I reliably use events to extend my applications if an application can complete successfully even if an event captured from it fails to be emitted?"

Solution: Synchronous emission mode

- New Synchronous emission mode option on the EP adapter. When Synchronous emission is used event emission is Assured.

- Causes events to be formatted and emitted as part of the capturing UOW.

- If the event fails to be emitted the capturing UOW will be backed out at syncpoint and its transaction is abended with ASP7.

- Not available for the Transaction Start adapter.

▼ **Advanced Options**
These optional dispatcher settings are for advanced users.

Emission Mode	○ Async ● Sync
Dispatch Priority	Normal
Transaction ID	
User ID	
Events are Transactional	☐

Synchronous Transactional Event Emission

- Use Synchronous Emission with a Transactional EP adapter

- Capturing UOW is backed out if the event emission fails

- Event is backed out if the capturing UOW fails.

- Event must be emitted to a recoverable resource.

- Adapter options
  - WMQ adapter – where the queue is recoverable
  - TSQ adapter – where the queue is recoverable
  - Custom adapter – where all actions are recoverable if the EPAP_RECOVER flag is set in the DFHEP.ADAPTPARM container.

# Let's see that in action…

Customer Question

"Can I capture events when something happens in my system, e.g. when a transaction abends or the system load goes over 80% of MAXTASKS?"

Solution: System event capture points

- 6 new system event capture points

- Capture events when:
  - DB2 connection status changes
  - FILE enable status changes
  - FILE open status changes
  - Unhandled transaction abends
  - Current active tasks for a TRANCLASS goes above or below a certain percentage of MAXACTIVE.
  - Current active task in a region goes above or below a certain percentage of MAXTASKs.

System Capture Point
DB2 CONNECTION STATUS
FILE ENABLE STATUS
FILE OPEN STATUS
TASK THRESHOLD
TRANCLASS TASK THRESHOLD
TRANSACTION ABEND
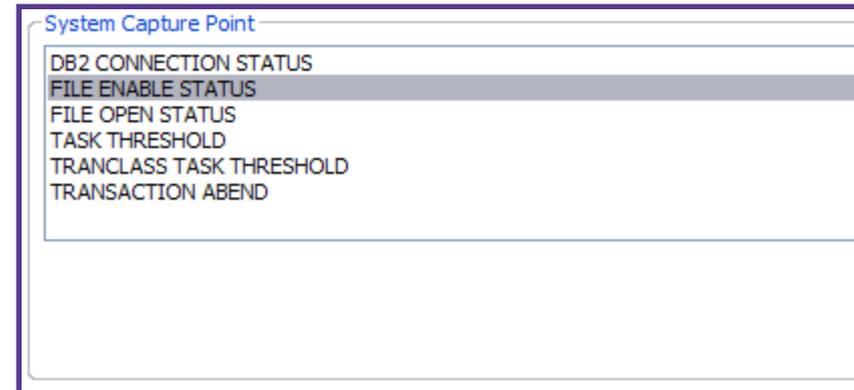
System event capture points
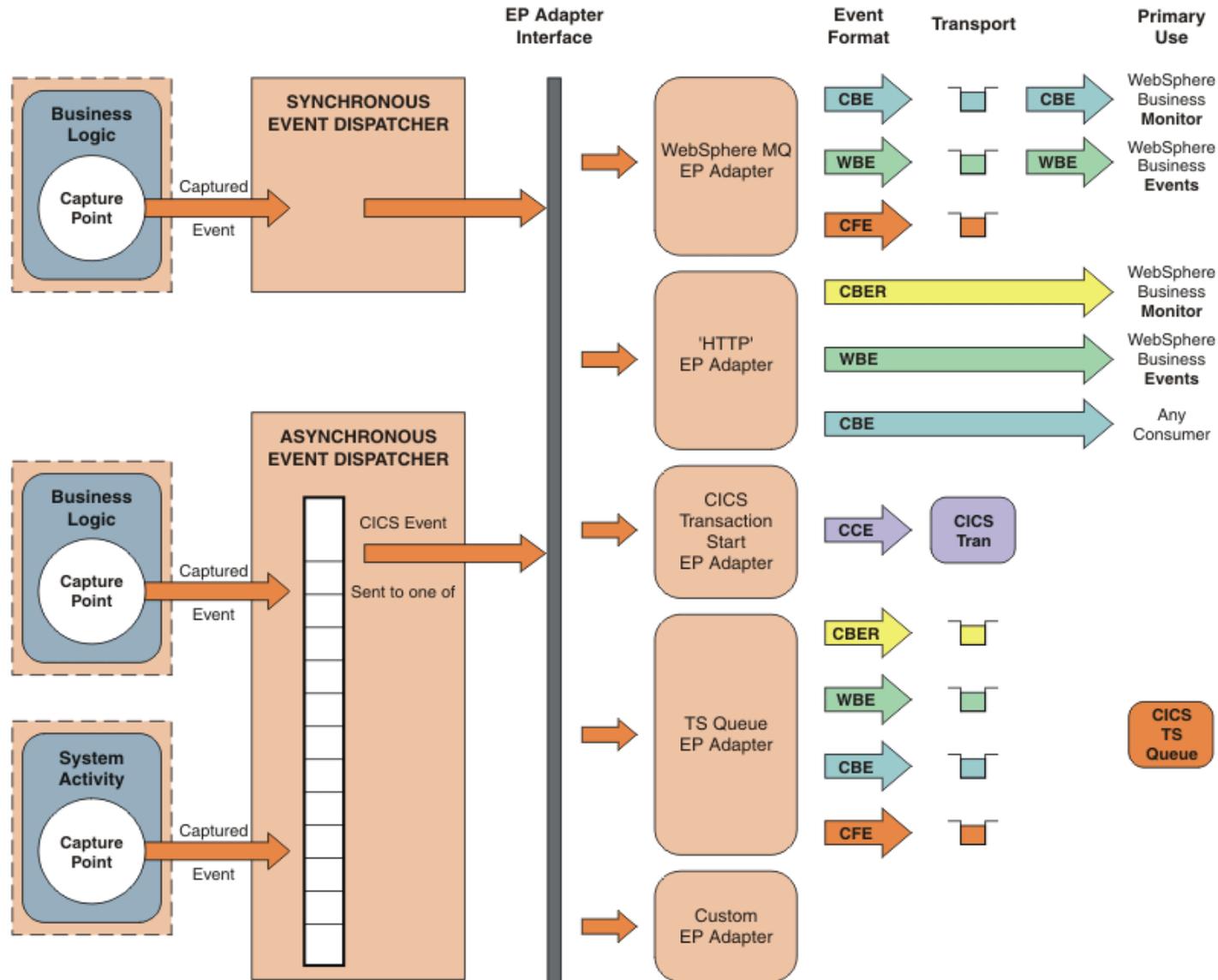
System event capture point details

- No Polling - Events are captured and emitted when the system condition of interest occurs.

- Configured, managed and deployed using the Event Binding Editor just like application events in CICS V4.1.

- Emitted using EP adapters

- Do NOT support synchronous or transactional EP adapters.

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Task Threshold capture point details

- TASK_THRESHOLD and TRANCLASS_TASK_THRESHOLD

- Can capture an event when current active tasks for a region or a TRANCLASS

  - Goes above 60%, 70%, 80%, 90%, 100%*

  - Goes below 50%, 60%, 70%, 80%, 90%*

    *of MAXTASKs or MAXACTIVE.

- Need to consider the effect of tasks attached as a result of event emission e.g. some EP adapters are run under a new task

Preventing task threshold event flooding

- Events can be captured only when the number of active tasks crosses a new threshold boundary

- This prevents event flooding when workloads flip flop across a threshold.
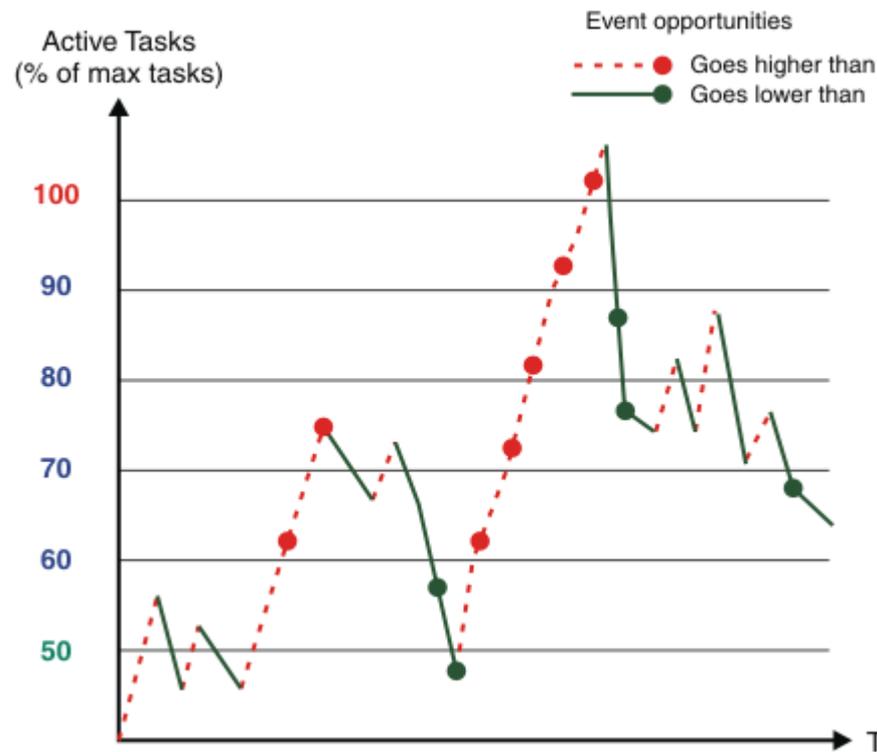
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Summary

- ## Context/Setting the Scene
  - Information everywhere and consumable.
  - Need to instrument applications…
  - …through functionality provided by the computing environment.

- ## Event Processing in CICS V4.1
  - Business event processing
  - CICS 4.1 event processing capabilities
  - Concepts and configuration

- ## Event Processing in CICS V4.1 Demo

- ## Event Processing in CICS V4.2
  - Separate EP adapters
  - EP Search
  - Synchronous Emission Mode and Assured Events
  - System Events

- ## Event Processing in CICS V4.2 Demo

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Any Questions?

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